

claims, rather than by the foregoing description. All changes that come within the meaning and range of equivalency of the claims are to be embraced within their scope.

What is claimed and desired to be secured by United States Letters Patent is:

1. A method for constructing a self-registering hologram, the method comprising:
providing a first photonic source characterized by a first wavefront of arbitrary shape and fixed at a first arbitrary source position in a frame having a first arbitrary frame location;
providing a second photonic source characterized by a second wavefront of arbitrary shape and fixed at a second arbitrary source position with respect to the frame;
directing energy from the first and second photonic sources to a first surface fixed at a first arbitrary surface location in the frame and comprising a photo-reactive material;
developing the photo-reactive material into a first hologram; and
re-locating the frame to a second arbitrary frame location, the frame continually maintaining in registration the first wavefront and the first hologram with respect to one another.

2. The method of claim 1, wherein developing further comprises reacting the photo-reactive material while in the frame.

3. The method of claim 2, wherein developing further comprises maintaining registration of the first surface with respect to the frame by immersing the frame and first surface in a developer medium.

4. The method of claim 1, wherein each of the first and second photonic sources further comprises a remote energy source, an input port, and a photonic transmission path extending therebetween.

5. The method of claim 4, wherein the photonic transmission path corresponding to the first photonic source further comprises a photonic fiber.

6. The method of claim 5, wherein the input port corresponding to the first photonic source further comprises an end surface of the photonic fiber.

7. The method of claim 6, wherein the end surface is configured in a non-selected, arbitrary shape configured to illuminate the first surface.

8. The method of claim 6, wherein the second photonic source is configured to emit a second beam, the first photonic source is configured to emit a first beam, and the first and second beams are configured to interact, creating an interference pattern of arbitrary at the first surface.

9. The method of claim 8, wherein developing further comprises immersing the input port, the frame and the first surface in a developing medium.

10. The method of claim 1, wherein developing further comprises:
removing the photo-reactive material from the frame;
chemically reacting the photo-reactive material; and
replacing the first surface in the frame.

11. The method of claim 1, further comprising providing a registration monument on the frame for automatically and repeatably registering the first surface thereagainst without requiring a measuring process.

12. The method of claim 1, wherein the first hologram is characterized by a first phase-modulation characteristic, and wherein the method further comprises providing a second hologram, self-registering in the frame and having a second phase-modulation characteristic different from the first phase-modulation characteristic.

13. The method of claim 12, wherein providing the second hologram further comprises:
providing a second surface fixed at a second arbitrary surface location in the frame, and comprising a photo-reactive material;
changing the relative phase between the first and second photonic surfaces; and
directing energy from the first and second sources to the second surface; and
developing the photo-reactive material of the second surface into second hologram.

14. The method of claim 13, further comprising forming a first holographic lens fixed to the frame.

15. The method of claim 14, wherein forming the first holographic lens further comprises directing energy of the second source from a location spaced from a first side of the first surface and focusing the energy at a first focal location spaced from a second side of the first surface and opposite the first side.

16. The method of claim 15, further comprising forming a second holographic lens.

17. The method of claim 14, wherein forming the first holographic lens further comprises: directing energy of the second source toward the first surface and from a location spaced from a first side of the first surface; and forming a virtual focus for the energy at a first virtual focal location spaced from the first side of the first surface.

18. The method of claim 17, wherein the first virtual focal location is spaced a substantially infinite distance from the first surface.

19. The method of claim 17, further comprising providing, subsequent to developing the photo-reactive material, a third photonic source providing a third wavefront substantially identical to the second wavefront and propagating in a direction opposite thereto.

20. The method of claim 19, further comprising reconstructing a fourth wavefront substantially identical to the first wavefront and propagating in a direction opposite thereto.

21. The method of claim 20, wherein reconstructing further comprises directing energy from the third photonic source toward the first hologram to provide the fourth wavefront.

22. The method of claim 21, wherein:

the first source further comprises a remote energy source, a photonic interface surface, and a photonic transmission path extending therebetween; and

the photonic interface surface is configured to produce the first wavefront.

23. The method of claim 22, wherein reconstructing further comprises propagating the reconstructed fourth wavefront from the first hologram.

24. The method of claim 23, further comprising producing a fifth wavefront in the photonic transmission path by propagating the fourth wavefront into the photonic interface surface.

25. The method of claim 24, wherein:

directing energy from the first photonic source to the first surface further comprises propagating a sixth wavefront from the remote energy source to the photonic interface surface to produce the first wavefront; and

wherein the fifth wavefront is substantially identical to the sixth wavefront and propagated in a direction opposite thereto.

26. The method of claim 25, further comprising controlling energy transmitted from the third source into the fifth wavefront by controlling, by selective development of the first hologram, a diffraction efficiency corresponding to the first hologram.

27. The method of claim 26, wherein the photonic transmission path corresponding to the fifth wavefront further comprises a photonic fiber, and wherein the photonic interface surface is the end surface of the photonic fiber.

28. The method of claim 27, wherein the end surface is of an arbitrary shape.

29. The method of claim 28, further comprising configuring the diffraction efficiency of the first hologram to have a value of greater than fifty percent in order to direct a portion greater than fifty percent of the energy from the third photonic source into the photonic fiber.